

## CLAIMS

What is claimed is:

- 1           1.       A method of forming a coating onto a surface of a prosthesis,  
2       comprising the acts of:
  - 3                   (a) providing a composition; and
  - 4                   (b) depositing said composition in a preselected geometrical pattern  
5       onto a first surface of said prosthesis to form said coating.
- 1           2.       The method of Claim 1, wherein said prosthesis is a stent having a  
2       plurality of struts.
- 1           3.       The method of Claim 2, wherein said stent is selected from a group  
2       of balloon-expandable stents and self-expandable stents.
- 1           4.       The method of Claim 1, wherein said composition comprises a  
2       polymer.
- 1           5.       The method of Claim 4, wherein subsequent to said act of  
2       depositing said composition, the method additionally comprises the act of heating  
3       said polymer.
- 1           6.       The method of Claim 4, wherein said composition additionally  
2       comprises a therapeutic substance.

1           7.       The method of Claim 6, wherein said polymer constitutes from  
2       about 50% to about 99.9% by weight of the total weight of said composition and  
3       said therapeutic substance constitutes from about 0.1% to about 50% by weight of  
4       the total weight of said composition.

1           8.       The method of Claim 6, wherein said therapeutic substance is  
2       selected from a group of antineoplastic, antiinflammatory, antiplatelet,  
3       anticoagulant, antifibrin, antithrombin, antimitotic, antiproliferative, antibiotic,  
4       antioxidant, antiallergic substances, and combinations thereof.

1           9.       The method of Claim 4, wherein said composition additionally  
2       comprises a solvent.

1           10.      The method of Claim 9, wherein said polymer constitutes from  
2       about 0.1% to about 25% by weight of the total weight of said composition and  
3       said solvent constitutes from about 75% to about 99.9% by weight of the total  
4       weight of said composition.

1           11.      The method of Claim 9, wherein said method additionally  
2       comprises the act of removing essentially all of said solvent from said composition  
3       on said prosthesis.

1           12.      The method of Claim 6, wherein said composition additionally  
2       comprises a solvent.

1           13.      The method of Claim 12, wherein said polymer constitutes from  
2       about 0.1% to about 25% by weight of the total weight of said composition, said

3 solvent constitutes from about 50% to about 99.8% by weight of the total weight of  
4 said composition and said therapeutic substance constitutes from about 0.1% to  
5 about 50% by weight of the total weight of said composition

1 14. The method of Claim 12, wherein said method additionally  
2 comprises the act of removing essentially all of said solvent from said composition  
3 on said prosthesis.

1 15. The method of Claim 1, wherein said composition comprises a  
2 therapeutic substance.

1 16. The method of Claim 15, wherein said therapeutic substance is  
2 selected from a group of antineoplastic, antiinflammatory, antiplatelet,  
3 anticoagulant, antifibrin, antithrombin, antimitotic, antiproliferative, antibiotic,  
4 antioxidant, antiallergic substances, and combinations thereof.

1 17. The method of Claim 15, wherein said composition additionally  
2 comprises a solvent.

1 18. The method of Claim 17, wherein said therapeutic substance  
2 constitutes from about 0.1% to about 50% by weight of the total weight of said  
3 composition, said solvent constitutes from about 50% to about 99.9% by weight of  
4 the total weight of said composition.

1 19. The method of Claim 17, wherein said method additionally  
2 comprises the act of removing essentially all of said solvent from said composition  
3 on said prosthesis.

1           20.     The method of Claim 1, wherein said composition comprises a  
2     monomer.

1           21.     The method of Claim 20, wherein subsequent to said act of  
2     depositing said composition, the method additionally comprises the act of curing  
3     said monomer to form a polymeric coating.

1           22.     The method of Claim 20, wherein said composition additionally  
2     comprises a therapeutic substance.

1           23.     The method of Claim 22, wherein subsequent to said act of  
2     depositing said composition, the method additionally comprises the act of curing  
3     said composition to form a polymeric coating.

1           24.     The method of Claim 22, wherein said monomer constitutes from  
2     about 50% to about 99.9% by weight of the total weight of said composition and  
3     said therapeutic substance constitutes from about 0.1% to about 50% by weight of  
4     the total weight of said composition.

1           25.     The method of Claim 22, wherein said therapeutic substance is  
2     selected from a group of antineoplastic, antiinflammatory, antiplatelet,  
3     anticoagulant, antifibrin, antithrombin, antimitotic, antiproliferative, antibiotic,  
4     antioxidant, antiallergic substances, and combinations thereof.

1           26.     The method of Claim 20, wherein said composition additionally  
2     comprises a solvent.

1           27.     The method of Claim 26, wherein said monomer constitutes from  
2     about 0.1% to about 50% by weight of the total weight of said composition and  
3     said solvent constitutes from about 50% to about 99.9% by weight of the total  
4     weight of said composition.

1           28.     The method of Claim 26, wherein said method additionally  
2     comprises the act of removing essentially all of said solvent from said composition  
3     on said prosthesis.

1           29.     The method of Claim 22, wherein said composition additionally  
2     comprises a solvent.

1           30.     The method of Claim 29, wherein said method additionally  
2     comprises the act of removing essentially all of said solvent from said composition  
3     on said prosthesis.

1           31.     The method of Claim 29, wherein said monomer constitutes from  
2     about 0.1% to about 49.9% by weight of the total weight of said composition, said  
3     therapeutic substance constitutes from about 0.1% to about 50% by weight of the  
4     total weight of said composition, and said solvent constitutes from about 49.9% to  
5     about 99.8% by weight of the total weight of said composition.

1           32.     The method of Claim 1, wherein said act of depositing said  
2     composition in a preselected geometrical pattern comprises the act of:  
3                 moving a dispenser assembly along a predetermined path while  
4     depositing said composition onto a stationary prosthesis.

1           33.    The method of Claim 1, wherein said act of depositing said  
2 composition in a preselected geometrical pattern comprises the act of:  
3                   moving a holder assembly supporting said prosthesis along a  
4 predetermined path while a stationary dispenser assembly deposits said  
5 composition onto said prosthesis.

1           34.    The method of Claim 1, wherein said act of depositing said  
2 composition in a preselected geometrical pattern comprises the acts of:  
3                   moving a holder assembly supporting said prosthesis along a first  
4 predetermined path; and  
5                   moving a dispenser assembly along a second predetermined path.

1           35.    The method of Claim 1, wherein said preselected geometrical  
2 pattern is a continuous stream.

1           36.    The method of Claim 35, wherein said continuous stream is formed  
2 in a pattern selected from a group of a straight line, a curved line, and an angular  
3 line.

1           37.    The method of Claim 1, wherein said preselected geometrical  
2 pattern is an intermittent pattern of said composition.

1           38.    The method of Claim 37, wherein said intermittent pattern is formed  
2 in a pattern selected from a group of a straight line, a curved line, and an angular  
3 line.

1           39.     The method of Claim 37, wherein said intermittent pattern includes  
2     beads.

1           40.     The method of Claim 1, wherein said prosthesis contains a channel  
2     and extending from a first position along said first surface to a second position  
3     along said first surface and wherein said act of depositing said composition in a  
4     preselected geometrical pattern comprises depositing said composition at least  
5     partially within said channel.

1           41.     The method of Claim 2, wherein at least one strut of said plurality  
2     of struts contains a channel and extending from a first position along said at least  
3     one strut to a second position along said at least one strut and wherein said act of  
4     depositing said composition in a preselected geometrical pattern comprises  
5     depositing said composition at least partially within said channel.

1           42.     The method of Claim 1, wherein said prosthesis contains a first  
2     cavity within said first surface and wherein said act of depositing said composition  
3     in a predetermined geometrical pattern comprises the act of depositing said  
4     composition at least partially within said first cavity.

1           43.     The method of Claim 42, wherein said predetermined geometrical  
2     pattern is a bead having a bead diameter.

1           44.     The method of Claim 2, wherein at least one strut of said plurality  
2     of struts contains a first cavity and wherein said act of depositing said composition  
3     in a predetermined geometrical pattern comprises the act of depositing said  
4     composition at least partially within said first cavity.

1           45.     The method of Claim 1, wherein said composition is a first  
2 composition, said method additionally comprising the act of:  
3                   depositing a second composition in a preselected geometrical  
4 pattern onto said prosthesis.

1           46.     The method of Claim 1, wherein, after said act of depositing said  
2 composition, the method additionally comprises the act of:  
3                   redistributing said composition from said first surface to a second  
4 surface of said prosthesis.

1           47.     The method of Claim 46, wherein said act of redistributing said  
2 composition is accomplished using air pressure.

1           48.     The method of Claim 46, wherein said act of redistributing said  
2 composition is accomplished using centrifugal force.

1           49.     The method of Claim 46, wherein said act of redistributing said  
2 composition is accomplished using a low viscosity solvent, wherein said low  
3 viscosity solvent is applied to said composition on said first surface of said  
4 prosthesis to dilute said composition thereby allowing said composition to flow  
5 from said first surface to said second surface of said prosthesis.

1           50.     An apparatus for depositing a composition onto a surface of a  
2 prosthesis comprising:

3                   (a)     a dispenser assembly having a nozzle for depositing a  
4 composition onto a surface of a prosthesis;

5                   (b)     a holder assembly for supporting a prosthesis; and



6 (c) a motion control system for either  
7 i) moving said dispenser assembly along a  
8 predetermined path or  
9 ii) moving said holder assembly along a predetermined  
10 path.

1 51. The device of Claim 50, wherein said dispenser assembly can  
2 deposit said composition in a preselected geometrical pattern onto said surface of  
3 said prosthesis.

1 52. The device of Claim 51, wherein said dispenser assembly is an  
2 inkjet printhead.

1 53. The device of Claim 51, wherein said dispenser assembly is a  
2 microinjector.

1 54. The device of Claim 53, wherein said microinjector has an injection  
2 volume ranging between approximately 2 nL and approximately 70 nL.

1 55. The device of Claim 70, wherein said prosthesis is a stent having a  
2 plurality of struts.

1 56. The device of Claim 55, wherein said dispenser assembly can  
2 deposit said composition in a preselected geometrical pattern onto at least one strut  
3 of said plurality of struts.

1           57.     The device of Claim 51, wherein said preselected geometrical  
2     pattern is a continuous stream starting at a first selected position on said surface of  
3     said prosthesis and ending at a second selected position on said surface of said  
4     prosthesis, said continuous stream having a selected stream width.

1           58.     The device of Claim 57, wherein said continuous stream is formed  
2     in a pattern selected from a group of a straight line, a curved line, and an angular  
3     line.

1           59.     The device of Claim 51, wherein said preselected geometrical  
2     pattern is an intermittent pattern.

1           60.     The device of Claim 59, wherein said intermittent pattern is formed  
2     in a pattern selected from a group of a straight line, a curved line, and an angular  
3     line.

1           61.     The device of Claim 50, wherein said dispenser assembly can  
2     deposit said composition in a preselected geometrical pattern at least partially  
3     within a channel and extending from a first position to a second position along said  
4     surface of said prosthesis.

1           62.     The device of Claim 50, wherein said dispenser assembly can  
2     deposit said composition in a preselected geometrical pattern at least partially  
3     within at least one cavity in said surface of said prosthesis.

1           63.     The device of Claim 62, wherein said preselected geometrical  
2     pattern is deposited at least partially within each of said at least one cavity in said  
3     surface of said prosthesis.

1           64.     The device of Claim 62, wherein said preselected pattern is  
2 deposited at least partially within some but not all of said at least one cavity in said  
3 surface of said prosthesis.

1           65.     The device of Claim 50, wherein said dispenser assembly can  
2 deposit a second composition in a preselected geometrical pattern onto said surface  
3 of said prosthesis.

1           66.     The device of Claim 50, wherein said nozzle is a first nozzle for  
2 depositing a first composition and wherein said dispenser assembly additionally  
3 has a second nozzle for depositing said second composition.

1           67.     The device of Claim 50, wherein said nozzle has an orifice having  
2 an orifice diameter in the range of approximately 0.5 microns to approximately 150  
3 microns.

1           68.     The device of Claim 50, wherein said nozzle has an orifice that can  
2 capture a last droplet of said composition to prevent lifting of said last droplet from  
3 said prosthesis.

1           69.     The device of Claim 50, wherein said nozzle can be positioned at a  
2 90° angle with respect to said prosthesis during deposition of said composition onto  
3 said prosthesis.

1           70.     The device of Claim 50, wherein said nozzle can be positioned at an  
2 angle less than 90° with respect to said prosthesis during deposition of said  
3 composition onto said prosthesis.

1           71.     The device of Claim 50, wherein said dispenser assembly is coupled  
2     to a delivery control system.

1           72.     The device of Claim 71, wherein said delivery control system is in  
2     communication with a CPU.

1           73.     The device of Claim 50, wherein said motion control system is for  
2     moving said dispenser assembly along a predetermined path.

1           74.     The device of Claim 73, wherein said motion control system can  
2     move said dispenser assembly along said predetermined path in a direction selected  
3     from a group of along the x-axis, along the y-axis, along the z-axis, rotational, or a  
4     combination thereof.

1           75.     The device of Claim 73, wherein said holder assembly remains  
2     stationary.

1           76.     The device of Claim 73, wherein said dispenser assembly is coupled  
2     to said motion control system through a driving component.

1           77.     The device of Claim 50, wherein said motion control system is for  
2     moving said holder assembly along a predetermined path.

1           78.     The device of Claim 77, wherein said motion control system can  
2     move said holder assembly along said predetermined path in a direction selected

3 from a group of along the x-axis, along the y-axis, along the z-axis, rotational, or a  
4 combination thereof.

1 79. The device of Claim 77, wherein said dispenser assembly remains  
2 stationary.

1 80. The device of Claim 77, wherein said holder assembly is coupled to  
2 said motion control system through a driving component.

1 81. The device of Claim 77, wherein said motion control system is in  
2 communication with a CPU.

1 82. The device of Claim 73, wherein said motion control system is a  
2 first motion control system for moving said dispenser assembly along a first  
3 predetermined path, and wherein said holder assembly is coupled to a second  
4 motion control system for moving said holder assembly along a second  
5 predetermined path.

1 83. The device of Claim 82, wherein said holder assembly is coupled to  
2 said second motion control system through a driving component.

1 84. The device of Claim 82, wherein said first motion control system  
2 can move said dispenser assembly along said first predetermined path in a  
3 direction selected from a group of along the x-axis, along the y-axis, along the z-  
4 axis, rotational, or a combination thereof and wherein said second motion control  
5 system can move said holder assembly along said second predetermined path in a  
6 direction selected from a group of along the x-axis, along the y-axis, along the z-  
7 axis, rotational, or a combination thereof.

1           85.    The device of Claim 82, wherein said second motion control system  
2    is in communication with a CPU.

1           86.    The device of Claim 50, additionally comprising a feedback system.

1           87.    The device of Claim 86, wherein said feedback system comprises:  
2                   a video camera for capturing an image;  
3                   a lens system coupled to said video camera;  
4                   frame grabber hardware to accept said image; and  
5                   vision software to characterize said image;  
6                   wherein feedback is provided to direct deposition of said  
7    composition onto said surface of said prosthesis.

1           88.    The device of Claim 87, wherein said image is of an individual  
2    strut.

1           89.    The device of Claim 87, wherein said image is of a characteristic of  
2    said prosthesis.

1           90.    The device of Claim 87, wherein said image is of a unique pattern  
2    on said prosthesis.

1           91.    The device of Claim 87, wherein said image is of said nozzle  
2    relative to a particular location on said prosthesis.

1           92.    The device of Claim 87, wherein said feedback is directed to said  
2   dispenser assembly.

1           93.    The device of Claim 87, wherein said feedback is directed to said  
2   holder assembly.